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ABSTRACT

This monograph presents personal insights gained during the teaching of a course in elementary mathematics teaching methods. The class was developed on the premise that children are active constructors of mathematical meaning. The course consisted of teaching sessions, action research projects, and demonstrations. To assess student learning from these teaching experiences, a portion of the final exam required that each student identify the ten most important things learned during the course. Analysis of student responses led to the identification of five clusters: instructional strategies, planning for teaching, teaching for understanding, teacher interactions, and issues in mathematics education. These clusters matched the instructional goals of the course. An important finding was that 13 students out of a total enrollment of 19 indicated gender equity as one of their most important discoveries from this course. Included are assignments, informal mathematics interview format, coaching form, verbal interactions observation form, verbal interactions explanation, math lesson assessments, and the final exam. (JRH)

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ED 402 185

Focusing on Equity in An Elementary Mathematics Methods Course

A Paper Presented at
The Joint Conference on Teaching Science and Mathematics
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November 8, 1996

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Focusing on Equity in An Elementary Mathematics Methods Course

Larry D. Burton, Ph.D.
Andrews University

In this monograph, I would like to share with you insights I have gained in the teaching of a course in elementary mathematics teaching methods.

Glimpses of Tuesday

8:40 am

Pairs of college students are huddled in the hallway of the university lab school. Piles of materials (some neat, some not) are spread around each cluster of students. I wander from pair to pair and listen to the interaction between peers. Eighteen of my nineteen students are here on time. Renee is late again.

I approach one pair. Shelly, the "coach," is busy scribbling notes as her partner Anna, the "teacher" for today, answers questions about her lesson. Anna picks up a stack of base-ten blocks as she describes a specific portion of her lesson. Turning, she asks if I have any extra blocks that she can borrow for her presentation. I bring my box of "goodies" over and Anna signs out additional base-ten blocks. I remind her that students can easily work in pairs, trios, or quads. Every student does not need a complete set of base-ten blocks. However, Anna is a bit nervous about running out of materials today. Last week, her lesson didn't go quite as planned and she doesn't want anything to go wrong today. She is in the "first" group. She will begin her lesson at 8:50 after the class finishes opening exercises.

8:45 am

Jack is still waiting to begin his coaching session with Renee. He strolls into the empty gymnasium and shoots a few baskets. He doesn't want to sit around until she

arrives. Renee has a tendency to arrive "late" for class on teaching days. They are in the "second" group. Jack will not begin teaching his group of six fourth graders until 9:15 after the students return from PE class.

8:47 am

I accompany the "first" group down the hallways to Mrs. Young's fourth-grade classroom. We arrive just as the class finishes their opening routines. As my teacher candidates enter the classroom, the fourth graders are moving their desks to form their instructional groups. Interaction is lively and cheerful. The teacher candidates launch their lessons. Mindy takes her group off to the playground for a mathematics scavenger hunt. Her coach, Cindy, follows her with clipboard in hand.

9:35 am

The "first" group has finished their lessons. The "second" group is 20 minutes into their lessons in Miss Walker's classroom. In the hallway outside Mrs. Young's classroom, pairs of teacher candidates are once again clustered and discussing today's lesson. Now Mindy reflects on her teaching. She really liked the student's active involvement in measuring the distances they could long jump. But she was a bit disappointed in her ability to bring the students back to the academic task after the jumping and measuring. They didn't want to stop jumping to average their measurements! Cindy shares her observations as coach: a large number of high-level questions Mindy used; a fairly equal number of instructional interactions between Mindy and both boys and girls. The coaching session ends by looking forward to the

next week. Mindy shares her goals for her lesson next week. All through the hallway, coaching pairs are conducting similar sessions.

The Foundation on Which the Class was Built

So, what kind of class is this and why was it configured as an experiential immersion in mathematics education? The class was developed on the premise that children are active constructors of mathematical meaning. This construction of meaning is dependent upon the use of concrete representations of mathematical concepts, the connection of these concepts to real-life experiences, and the communication of these concepts through the language of the child.

The mathematics teacher who leads students into this kind of a learning experience must possess a "toolbox" full of teaching strategies. Additionally, the teacher must know how to use these strategies in appropriate ways and at appropriate times. The master mathematics teacher must possess the ability to utilize a wide variety of instructional materials to aid the construction of individual meaning. Beyond commercially available manipulative materials, the powerful mathematics teacher utilizes common items such as beans and "found" materials such as egg cartons to communicate concrete models of mathematical concepts. The effective mathematics teacher must also be able to reach the studentsTobias (1990) refers to as the "second tier." The "second tier" includes those students who are capable of achieving in mathematics but are often neglected in mathematics instruction. The "second tier" includes many females and minority students.

How I Tried to Pull it Off

So I needed to design the experiences in my course to meet these lofty goals. The basic structure of the methods class was developed by Dr. Shirley Freed, my colleague at Andrews University. However, as the new teacher of the course, I had to take "her" class design and turn it into "my" class design. I had to construct the class anew, while attempting to retain the basic components developed by Dr. Freed.

I began the course by laying the theoretical foundation. During the first two class periods I used a variety of teaching techniques (primarily cooperative) to present basic issues in mathematics education, constructivist theory, Piaget's concept of developmental levels, the NCTM standards, and concerns related to curriculum materials and planning for instruction.

The course was designed around a core of seminal experiences. After the first week of class, the basic pattern of class sessions was as follows:

> Tuesdays and Thursdays the class met at the University Lab School for interaction with students. After the second week this interaction took the form of teaching sessions as described at the beginning of this article. Friday mornings the class met at the School of Education. During these sessions I demonstrated the use of specific manipulatives, modeled teaching strategies, and taught sample lessons. The Friday sessions were designed to prepare the teacher candidates for their teaching sessions during the following week.

The heart of the course was a series of seven teaching sessions conducted by each teacher candidate. Since the teacher candidates were placed in pairs, half of the

group taught on Tuesdays and half of the group taught on Thursdays. The non-teaching partner served as coach/observer for the teaching partner. To provide practice in the use of the observation form, all of my students watched a short videotaped mathematics lesson while completing an observation form. As a class, we then tallied and discussed the results. Many students were confused about filling out the observation form. A lesson was learned, the form was too complex.

Three, small action-research projects were the second major portion of the course. The first of these action-research projects was the videotaped teacher observation described above. During the second week of class, my students visited the kindergarten class at the University School and conducted Piagetian interviews with individual students for the second action-research project. Most students were able to conduct three or more interviews to assess the kindergartners' developmental levels. As would be expected, the interviews identified both pre-operational and concrete operational students. Some of my students were surprised to discover that the same child could be pre-operational in one area and concrete operational in another area. To synthesize our experience, we pooled our data and looked at the results from several perspectives, including age and gender.

The final action-research project involved the conducting of informal mathematics interviews with students in grades one through eight. Each of the teacher candidates conducted between five and ten interviews in math classes while students were working on that day's assignment. Again, we compiled our data as a class and

represented it graphically in a variety of forms. This activity clearly revealed the typical female shift away from mathematics in the upper elementary grades.

With these three projects to lay an experiential foundation for my students, we then began our journey toward powerful mathematics instruction. Over the next seven weeks, I presented demonstrations and additional foundational knowledge as needed. The teacher candidates developed, revised, and taught their lessons. To assess student learning from these teaching experiences a portion of the final exam required that each student identify the ten most important things learned during the course. An analysis of the group's response provides an interesting look at the things of value in the course from a student's perspective.

What the Students Perceived as Important

In analyzing the students responses about the most important things learned during the course, I initially divided the responses into logical groups. This resulted in 17 different categories in addition to a group composed of the responses that didn't seem to fit into any particular category. These 17 categorical groups were then placed into five separate clusters. Each cluster had to have a common thread that tied each of the category groups together. The three largest clusters, instructional strategies (57 responses), planning for teaching (41 responses), and teaching for understanding (37 responses), were easily identified and coherent. The fourth cluster, teacher interactions (27 responses), was composed of a wide range of loosely related categories and will not be reported in this paper. The final and smallest cluster concerned issues in mathematics education (17 responses).

Instructional Strategies

The instructional strategies cluster contained four categories of responses. The largest category contained 17 student responses about the use of a variety of instructional techniques in mathematics education. These responses typically included phrases such as "variety of teaching methods," "be creative," and "fun learning experience." One student expressed it this way, "There are a variety of teaching methods for any math concept. It is very important to use a variety of methods to maintain variety and excitement in the classroom." These basic ideas were repeated throughout the responses in this category. Another student said, " Be creative. Teachers need to get the students excited about math using a variety of techniques and materials. Students then begin to see math as fun." Many teacher candidates connected this idea of instructional variety to students' learning needs. For example, "Not every student learns the same way. Teachers must be prepared to alter their teaching style in order to reach every student."

Both the use of manipulatives and cooperative learning techniques evoked 15 responses by students. The responses concerning the use of math manipulatives seem to have come from personal experience during the small group teaching sessions One teacher candidate responded, "Visualizing math through manipulatives increases understanding. The students could not describe what a fraction was. After using manipulatives now they can. I did not tell them." Some teacher candidates related how their "students" responded to manipulatives. "Kids love manipulatives. Manipulatives make math fun and give students concrete examples of concepts." Many

responses implied, and one teacher candidate response explicitly stated the difference manipulatives had made personally. "Manipulatives help math make more sense. Many students (including me before (this class))can't see how math makes any sense because it's too abstract. But manipulatives make math more tangible and understandable."

The number of responses which related to cooperative learning techniques somewhat surprised me. I had designed the class on the basis of the individual construction of knowledge and hadn't planned any real emphasis on cooperative learning in my presentations. However, most of my demonstrations used cooperative techniques. Seven of the responses were about the usefulness of cooperative learning strategies. Here is a typical response, "Cooperative learning strategies help students get a better understanding of concepts when they have to talk about them (with) others." Another teacher candidate expressed it this way, "Cooperative learning can be used in a variety of ways in teaching math. Students learn more effectively if occasionally allowed to cooperate with others on various projects, activities, and assignments."

The second type of responses were related to skills learned that helped the teacher manage cooperative learning effectively. "Sponge ideas. One of my main problems has always been what to do with the kids that finish first. That is not a problem any longer." The need to structure individual accountability into cooperative learning lessons was also mentioned as a vital learning by teacher candidates. There were also a few specific comments about the realities of trying to maintain a

cooperative environment, including this one. "Boys and girls in fourth grade work OK in groups but not in pairs. 'Can we use walkie-talkies to do this so we do not have to sit together?'"

The fourth category of the instructional strategies cluster related to the integration of mathematics with "other" content areas, particularly language arts. Concerning the writing of journals in math class, one teacher candidate wrote, "Journaling is a very effective tool for both student and teacher. Although it was difficult to get my students into the journal mode for math class, I believe when they took it seriously, it helped them organize their thoughts on what they had just taken in. For me, journaling was a very effective reflecting tool this quarter." Other teacher candidates tended to speak more broadly about integrating the language arts. "There are fun and interesting ways of integrating math with reading, writing, and art. It is important for students to understand the relevance of math across the curriculum."

Preparation for Teaching

The cluster I call "Preparation for Teaching" includes only two categories: lesson planning and flexibility. Far and away the largest single category, lesson planning itself contained 32 responses. This means that this single category, lesson planning, was larger than either of the two smallest cluster of categories: teacher interactions and issues. One teacher candidate put it simply: "Be prepared. They will only learn what you have for them to learn." Over and over the responses echoed one another, "Be prepared. If you as the teacher don't know what to do next, the students definitely won't know either." "Make detailed lesson plans. If lesson plans aren't detailed

enough it is easy for the teacher to get off track. With detailed lesson plans it is easier to present a well organized lesson."

One teacher candidate ended her "top ten" list with the following: "The art of writing a lesson plan. As you see, this is at the bottom of my list, yet I do feel that this is important. In the case that you lose your place or train of thought, or even get sick so that someone must replace you, your lesson plans are important. The planning and organization that goes into it beforehand is of importance here, not so much following the guide step-by-step." While this teacher candidate appears to apologize for putting lesson plan writing at the bottom of her list, she actually started her list with a very similar item: "Teaching takes a lot of planning and preparation. I spent hours planning a 45 minute lesson for five students, one day a week -- how am I going to find the time for 7-8 classes per day, five days a week for over 20 students?" It is obvious that planning was weighing on the mind of this teacher-in-training, and she was not alone. I had 19 students in this methods course and 32 different responses related to lesson planning. Therefore, most of my students included two items related to lesson planning on their "top ten" list.

The second category in the "Preparation for Teaching" cluster dealt with flexibility in the execution of a planned lesson. One candidate responded, " Teachers need to be flexible in planning because unknown things interfere in plans." Another expressed it this way, "Be flexible. If the students seem bored or not understanding, I can make a quick change without throwing my entire lesson off balance." Others also emphasized that flexibility was tied to student needs, "Be flexible. Teachers need to let

children go at their own pace and adjust to fit their (the students') needs.". One teacher candidate expressed the need for flexibility simply: "Flexibility: Most of the time the lesson plan changes."

Teaching for Understanding

This cluster of categories relate specifically to concerns about constructivist teaching. The three categories included in this cluster are as follows: conceptual teaching (14 responses), connection to real-life (12 responses), and basing instruction on students' prior knowledge (11 responses).

In the category of conceptual teaching, typical responses were similar to this, "Teach concept, not just process. It is important because otherwise they will get to a certain point and they won't be able to memorize the process anymore." A similar idea was presented by a second teacher candidate, "Math must be understood and not just memorized. I think I knew this. I had never (understood) how that was done." This response about teaching for understanding appeared at the top of one teacher candidate's list, "Students must understand 'why' not just how. Students need to understand why they solve problems if they are to really learn how to use math, and remember it in the future. It also tells them that they are learning something that is important, not just a series of steps."

Most teacher responses indicated an understanding of the interrelated nature of mathematics skills and conceptual understanding. For example, "Some kids must have speed drills before learning major concepts. It is very difficult to teach concepts when students have not mastered basic skills of addition, subtraction, multiplication, and

division." However, it appears that one of my students did not "get" the connection between the two. Her response was, "Students should learn concepts and not skills. When students understand concepts they are better able to make connections to real life and other subject areas."

Twelve different teacher candidates indicated that the ability to connect mathematics instruction to real life was an important learning from my class. The typical response was something like the following. "Application to real life must take place for the students to really internalize and have a use for what is being taught." "Real -- Math needs to be real so the student can understand how it applies to them in the real world." "Link math to real-life situations. If you can't really use it, you'll forget (it)."

Responses about assessing students' prior knowledge typically referred to what teacher candidates learned during their first teaching session at the lab school. One teacher candidate wrote, " It is hard jumping into something if you are unsure of what the students already know." Another said, "Know students' prior knowledge. You'll be able to determine what to start with to teach that topic." Other responses were a bit more philosophical, "Relate new things to prior knowledge. New concepts can be confusing, but if they are put into context with something familiar, it is easier to understand."

Issues in Mathematics Education

Of the 17 responses in this cluster, 13 were related to gender equity. Three responses referred to the importance of collegial support in effective teaching, while

one response concerned math anxiety. One teacher candidate wrote "Awareness of gender equity. Girls need to be set on equal footing with boys so that they will have as many chances to succeed as (the boys) do." For one of my students, this class represented the first time she had thought about gender inequity, "I never realized that it was a problem, and then my eyes were opened -- something I need to remember when teaching." Another teacher candidate submitted a parallel response, "I need to get in the patterns of treating my students equally NOW so I continue it when I'm out there teaching."

I was disappointed that only three respondents indicated the importance of peer interaction and support as a primary learning of the course. The responses in this category were insightful. One teacher appreciated the immediate debriefing that occurred after each teaching session. "Having a partner makes it easier to teach. Feedback right after teaching a lesson makes it much easier to make a successful lesson the next time around." One of my students was so sold on the coaching process that she wrote "how valuable my coach was in giving me useful, helpful feedback on my teaching. I now see great benefits of feedback and when I'm a teacher, I'll find ways to get as much feedback as possible."

What Does This Mean?

It was reassuring to me that the four clusters of important learning (from the students' perspectives) described in this paper match the instructional goals of the course. I think the fact that the largest cluster was instructional strategies is related to the leadership of the professor. I iterate in all of my classes that my goal is to help

each teacher candidate develop a "toolbox" full of techniques to use in the classroom. Indeed, it is one of the principles on which this course was founded. One of the major thrusts of my instruction was to model and describe a wide variety of techniques.

Two of the categories included in this cluster, use of manipulatives and integration of language into mathematics instruction, were "pushed" by the professor and included as components for assessing each lesson taught. (Remember, these components were part of the foundation of the course.) It appears that requiring students to include these elements in their lesson design assisted students in seeing these instructional techniques as important.

I was a bit surprised at the number of responses related to cooperative learning. I did not "push" cooperative learning in this class. I presented approximately five simple cooperative structures and suggested that the students try them out when teaching. Approximately half of the class had not received "formal" training in cooperative learning techniques and theory, but that did not stop them from experimenting. Many of the teacher candidates appeared eager to add cooperative teaching strategies to their "toolbox."

When I first looked at the data analysis for this paper I was surprised by the large number of responses in the category of lesson planning. However, upon reflection I realized I could have expected this for two reasons. Reason number one: this course represents one of the most active courses in the Teacher Education program in terms of how much teaching is actually done. Therefore, the teacher candidates must do a greater amount of planning. The lessons taught are also "real"

lessons -- 45-50 minutes in length, not micro-lessons of 10-15 minutes to be presented to peers.

Reason number two: the lessons represented THE major portion of the students grades for the quarter. I used a comprehensive, ten-part lesson evaluation assessment plan to evaluate each lesson. I am sure some of my students spent more time than usual designing their lessons to ensure that all required components of the lesson plan were included. This may account for the number of responses which indicate the importance of including instructional variety in lessons. All lessons constructed according to my assessment template HAD to include variety.

The flexibility concept was "caught" by the students on the job. Flexibility was not a topic I discussed in my presentations, yet it surfaced clearly as an important learning for more than half of my students. It is possible that I will include the "flexibility" concept in future presentations, or I may wait and see if it surfaces again in future classes.

Given the constructivist foundation of the course, I hoped that conceptual teaching and learning would be one of the important learnings from the course. However, I was not sure if my approach would accomplish my goals. However, the results from this final exam appear to support the success of my methodology. Since the use of developmental explanations was included on the observation forms, this concept was reinforced at each teaching session. The use of real-life connections to math was reinforced by the lesson evaluation process. Students learned during the first session that assessing the learners' prior knowledge was an absolute necessity.

The number of students who felt their learnings about gender equity in mathematics education were very important was a bit disappointing to me. However, 13 students out of a total enrollment of 19 indicated gender equity as one of their most important learnings from this course. It would be naive to expect ALL teacher candidates to see gender equity as vital in mathematics education.

However, I need to remember that I was studying novices in the field of teaching. It is possible that the overwhelming tasks of developing and executing lesson plans may have consumed the lion's share of time and attention for the six students who didn't "catch" the gender equity emphasis during this course. It is my hope that after those six teacher candidates enter the workforce, they will remember the head-on confrontation with the gender equity issue in my class. And, of course, I hope that memory will serve as the impetus for changing teaching behavior.

I hold onto these hopes because I have a vision of a classroom where ALL children are encouraged and supported as they learn mathematics. A place where ALL children not only survive mathematics, but actually thrive in mathematics. And yes, I do have a daughter.

Tobias, S. (1990). *They're not dumb, they're different*. Tucson, AZ: Research Corporation.

Assignments

1. **Action Research Projects**
(ACEI Goals 3.1, 7.2, 7.3, 7.4, 7.5)

Three sets of data will be collected early in the course in order to identify issues in math education and to lay a foundation for the remainder of the course.

a. Observation of classroom teacher & summary of verbal interactions
b. Piagetian interviews of kindergarten students
c. Interviews with 5-10 elementary children

50 X 3 = 150 pts.

2. **Teaching Elementary Students** (ACEI 7.5)

Each student will have seven (7) classroom instructional experiences, as follows:

1) + - x ÷ of whole numbers
2) x ÷ of fractions
3) + - of fractions
4) + - of decimals
5) X ÷ of decimals
6) geometry/measurement or statistics/probability
7) algebra concepts & trinomials

Following the classroom experience, a packet containing the lesson plan, observation form, reflection form, and student materials will be due (ACEI 5.5, 7.1, 7.2, 7.3, 7.4, 9.3). If you are unable to meet the teaching appointment, you will be permitted to turn in a lesson plan for half credit. Since you will be working in pairs, your level of cooperation and collegiality will partially determine the quality of this experience.

50 X 7 = 350 pts.

3. **Math Software Preview**
(ACEI 9.1, 12.8)

Preview two (2) mathematics software packages in the Media Center and write an evaluation of them.

25 X 2 = 50 pts.

4. **Teaching Strategies Grid**
(ACEI 7.1)

For each mathematics topic on the grid, fill in several ways you can conceptualize it, connect it to real-life, and communicate it.

50 pts.

5. **Verbal Interactions Summary**
(ACEI 7.1)

You will present a graphic, statistical summary of your verbal interactions with students. You will also develop a list of specific verbal interactions (questions, instructions, etc.) which support conceptual, meaningful learning by all students

100 pts.

6. **Midterm** 100 pts.

7. **Final Exam** 100 pts.

8. **Attendance & Participation**

How much you learn in this course is a function of how much you participate in class. You are 1-2 years away from seeking employment as a professional educator. I expect your behavior to reflect that professional proximity. Absences, tardies, and not completing tasks on time will result in the termination of your teaching contract. Therefore, in an effort to simulate this real world situation, each unexcused absence will result in a reduction of 20 points.

100 pts.

Total 1000 pts.

Informal Mathematics Interview

Student Name _____ Date_____

Age_____ Grade_____ Gender_____

1. Can you tell me what you're doing? (Write an example of the problems they're working on and their explanation.)

2. How are you solving the problem? (Tell me how you're thinking as you solve the problem.)

3. Do you have the correct answer?
How do you know?

4. Is there another way to solve it? (Can you describe another way of solving this problem?)

5. Are you good at Math?
What makes you good (not good)?

6. Do you like Math?
Why (Why not)?

Name of interviewer _____

Coaching Form

Teacher_____ Date_____

Observer_____ Student group_____

Planning (Filled in by observer)

1. How do you feel about the lesson?

2. What is the objective of the lesson?

3. Describe the lesson:

4. What are your verbal interaction goals?

5. What would you like me to watch for? What can I watch for or listen for that will give you useful information?

Observation (Filled in by observer)

6. Observations from #5 above plus other verbal interactions.

7. Goodies List (effective behaviors: principles, plan, progression, management, student behaviors, structures, creativity)

Teacher Behavior Student Responses

Reflection (Filled in by observer or teacher)

8. How do you feel about the lesson?

9. What did you like least?

10. What did you feel were some of the most positive aspects of the lesson?

11. Share behaviors listed in the Goodies List. Share the observations from #5 above.
12. What goals would you like to set for yourself next time?

Verbal Interactions Observation Form

Teacher_____ Date_____ Topic_____ Observer_____

Academic Interventions		***Directed at:***		
		Whole Class	♀ (Total =)	♂ (Total =)
Explanations	Developmental			
		Comments:	*Comments:*	*Comments:*
	Directive			
		Comments:	*Comments:*	*Comments:*
Praise	Specific			
		Comments:	*Comments:*	*Comments:*
	General			
		Comments:	*Comments:*	*Comments:*
Questions	High Level			
		Comments:	*Comments:*	*Comments:*
	Low Level			
		Comments:	*Comments:*	*Comments:*

Gender Language	**Sociogram**
Physical Movement	

Verbal Interactions Explanation

EXPLANATIONS

DEVELOPMENTAL -- Session leader has student explain his/her thinking and uses this to develop a solution or correct a misunderstanding. For example, "Tell me what you did here and why" or How do you think you would start the problem."

DIRECTIVE -- Session leader proceeds immediately to explain how to solve the problem. For example, "First you factor the trinomial and then you . . ."

PRAISE AND/OR CRITICISM

SPECIFIC -- Session leader gives specific praise/reinforcement for the intellectual quality of the work. For example, "The thinking strategy you used for factoring was a good one."

GENERAL -- Session leader gives general praise/reinforcement, such as "OK" or "Good Job."

QUESTIONS

HIGH LEVEL -- Session leader asks questions that require higher intellectual processes and questions that require students to use information, not just memorize it. For example, "What does (X-2) mean? Can you explain it in terms of distance using a number line?"

LOW LEVEL -- Session leader asks questions that require only memory on the part of the student. For example, "What do you do next?" or What is A times A?"

GENDER LANGUAGE

GENERIC -- Session leader uses generic language which excludes certain groups. For example, "he . . ." or "men . . ."

INCLUSIVE -- Session leader uses language to include everyone, such as, "He or she . . ." or "Men and women . . ."

PHYSICAL MOVEMENT

ENCOURAGING -- Session leader encourages participation. For example, responds to non-verbal cues such as making eye contact or leaning forward to respond.

DISCOURAGING -- Session leader discourages participation. For example, ignores non-verbal cues or positions body away from certain students.

SOCIOGRAM

A graphic representation of the interactions between individuals in a group. Arrows indicate direction of active communication.

Math Lesson Assessments

Teacher Candidate_____

	Lesson Plan Components	Manipulatives Spatial	Mental/ Estimation	Communication/ Lit/Writing	Authentic / Real Life	Problem Sequence	Congruence/ Lesson Logic	Reflection	Student Materials	Creativity (extra pts)	Total
Lesson 1											
Lesson 2											
Lesson 3											
Lesson 4											
Lesson 5											
Lesson 6											
Lesson 7											

Comments: 24

25

5EDTE457:03 Elementary Math Methods
Final Exam

Part 1: Written Exam

Bring the following to your oral final appointment:

(50 points)
1. Your other "best" lesson in publishable form. I need a hard copy and a copy on disk. Include the following details:

- author's name,
- a creative title,
- topic of the lesson,
- "grade" level of the lesson,
- list of materials,
- a detailed lesson plan,
- student materials (or a reference where you found them)

(25 points)
2. Identify the ten most important things you have learned in this class. Put them in order from most important to those of lesser importance. Give a **ONE SENTENCE** explanation of why you included each item (one sentence for each item).

Part 2: Oral Exam (75 points)

Plan and demonstrate an instructional sequence (15 minutes of instruction) that will lead to the successful teaching of the following:

- Addition of decimal numbers (1.37 + 3.78)
- Subtraction of decimal numbers (4.02 - 2.66)
- Multiplication of decimal numbers (2.3 x 3.3)
- Division of decimal numbers (3.22/1.4)
- Addition of mixed numbers with unlike denominators (2 1/4 + 1 1/2)
- Subtraction of mixed numbers with unlike denominators (2 1/4 - 1 1/2)
- Partitive and measurement division of a whole number and a fraction (4 ÷ 1/2)

Logical sequence = 25 points
Fluency = 25 points
Manipulatives = 25 points